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#8

PATENT
CASE NO. 2002P00329US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application:	)	
Andrew Li et al.	)	Examiner: Ali Imam
Serial No.: 10/080,367	)	Group: 3737
Filed: February 20, 2002	)	
For: AUTOMATIC ULTRASOUND TRANSMIT POWER SETTING METHOD AND SYSTEM	)	

SECOND RESPONSE AND AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action dated July 28, 2003, please enter the following amendments and consider the following remarks:

AMENDMENTS

1. (original) A method for automatically determining a transmitter power level, the method comprising:

(a) determining a noise level;

(b) determining a lowest value of a display dynamic range; and

(c) setting a transmit power as a function of the noise level and the lowest value.

2. (original) The method of Claim 1 wherein (a) and (b) comprise determining an excess signal-to-noise ratio and (c) comprises reducing a default transmit power by a transmit power reduction factor, the transmit power reduction factor a function of the excess signal-to-noise ratio.

3. (original) The method of Claim 2 wherein (c) comprises reducing by the transmit power reduction factor being equal to the excess signal-to-noise ratio.

4. (original) The method of Claim 1 further comprising:

(d) setting a gain as a function of transmit power; and

(e) preserving brightness based on (d) independent of user settings.

5. (original) The method of Claim 1 wherein (c) comprises, in the log domain:

(c1) calculating a difference between the noise level and the lowest value; and

(c2) reducing the transmit power as a function of the difference.

6. (original) The method of Claim 1 wherein (a) comprises:

(a1) acquiring a plurality of receive samples with transmitters off; and

(a2) determining the noise level as a function of amplitudes of the receive samples.

7. (original) The method of Claim 6 wherein (a1) comprises acquiring the plurality of receive samples responsive to default imaging parameters; and wherein (a) further comprises:

(a3) measuring an actual noise level as a function of the amplitude of the receive samples, wherein (a2) comprises predicting the noise level for current imaging parameters as a function of the actual noise level.

8. (original) The method of Claim 1 wherein (a) comprises determining the noise level from a table in response to current imaging parameters.

9. (original) The method of Claim 1 wherein (a), (b) and (c) are performed independently for each of a plurality of regions of an imaging field.

10. (previously presented) An ultrasound system for automatically determining a transmitter power level, the system comprising:

a transmitter responsive to a transmit power level; and

a processor operative to set the transmit power level as a function of a noise level and a lowest value of a display dynamic range.

11. (original) The system of Claim 10 wherein the processor is operative to determine an excess signal-to-noise ratio from the noise level and the lowest value and reduce a default transmit power by a transmit power reduction factor, the transmit power reduction factor a function of the excess signal-to-noise ratio, the default transmit power determined as a function of current imaging parameters.

12. (original) The system of Claim 10 further comprising:

a receive amplifier responsive to a gain, the gain being responsive to the transmit power level such that image brightness is substantially preserved independent of user settings.

13. (original) The system of Claim 10 wherein the processor is operative to, in the log domain, calculate a difference between the noise level and the lowest value, and reduce the transmit power as a function of the difference.

14. (original) The system of Claim 10 further comprising:

a receiver operable to acquire a plurality of receive samples with the transmitter off;

a detector operable to determine an amplitude of the receive samples; and

wherein the processor is operable to determine the noise level as a function of the amplitude of the receive samples.

15. (original) The system of Claim 10 further comprising:

a memory having a table of noise levels;

wherein the processor is operable to determine the noise level from the table in response to current imaging parameters.

16. (original) A method for automatically determining a transmitter power reduction factor in a medical ultrasound imaging system, the method comprising:

(a) determining an excess signal-to-noise ratio with a processor; and

(b) determining the transmitter power reduction factor as a function of the excess signal-to-noise ratio.

17. (original) The method of Claim 16 further comprising:

(c) displaying the transmitter power reduction factor.

18. (original) The method of Claim 16 further comprising:

(c) setting a transmitter power level as a function of the transmitter power reduction factor.

19. (original) The method of Claim 16 further comprising:

(c) initiating (a) and (b) in response to user input.

20. (original) The method of Claim 16 further comprising:

(c) recalculating a transmit power level in response to a change in an imaging parameter; and

(d) initiating (a) and (b) automatically in response to (c).

21. (original) The method of Claim 16 wherein (a) comprises:

(a1) determining a noise level; and

(a2) calculating the excess signal-to-noise ratio as a function of a difference, in the log domain, between a minimum display signal level and the noise level.

22. (original) The method of Claim 21 wherein (a1) comprises:

turning a transmit power off;

acquiring a plurality of receive samples that vary in range, the receive samples free of energy from a transmit; and

determining the noise level as a function of an envelope amplitude of the receive samples.

23. (original) A method for automatically determining a transmitter power reduction factor in a medical ultrasound imaging system, the method comprising:

(a) determining an excess power with a processor; and

(b) determining the transmitter power reduction factor as a function of the excess power.

24. (currently amended) A method for automatically determining a transmitter power reduction factor in a medical ultrasound imaging system, the method comprising:

(a) iteratively reducing a transmit power;

(b) determining a difference between a first signal at a default power level and a second signal at a power level responsive to (a); and

(c) selecting the transmit power wherein the difference exceeds a threshold.